

## PATENT ABSTRACTS OF JAPAN

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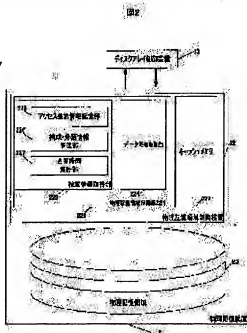
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ARAI HIROHARU

## (54) STORAGE SUB-SYSTEM, AND MEMORY USED THEREFOR

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To obtain an occupied time of a logic storage area in a physical memory, and to obtain precise access occupied time information in every I/O to the physical memory.

**SOLUTION:** A physical storage area controller 22 on the individual physical memory 15 is provided with a table 225 for storing information about access requirement from a host computer, a table 227 for totalizing the occupied time as to access, a table 226 for control information for classifying constitution of a disk array, and a data processing control part 224 for obtaining constitution information and classification information of the logic storage area from a disk array controller 13, and for requesting the constitution information and the classification information of the logic storage area to the disk array controller, when necessary. The disk array controller 13 is provided with a means for transmitting the constitution information of the disk array at the present time to the physical storage area controller in response to the request from the physical storage area controller on the physical memory.



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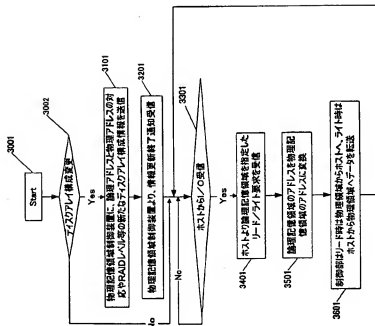






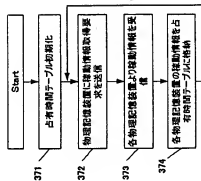
[図4]

図4



[図5]

図5

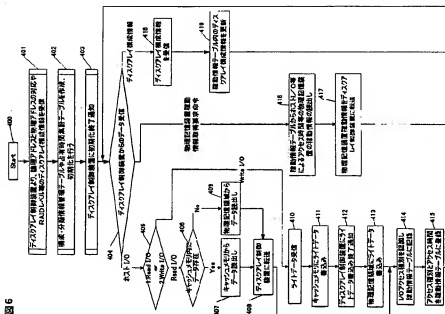


[図7]

図7

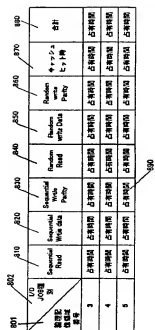
物理記憶装置番号	物理記憶装置アドレス	物理記憶装置容量	物理記憶装置アドレス	レイアウト	パーティション番号
0	0~199	0	0~199	1	100
1	100~199	0	100~199	1	100
2	200~299	0	200~299	1	100
3	300~399	1	0~199	5	120
4	400~499	1	100~199	5	120
5	500~599	1	200~299	5	120
...	...	...	...	...	...

[図6]



[図10]

図10



フロントページの続き

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## CLAIMS

[Claim 1]

1. A means to be connected to 1 or two or more computers, and to acquire the operating condition information on two or more physical memory equipments and two or more of these physical memory equipments. In the storage subsystem which has a means to perform matching with the logic storage region which said computer makes a read/write object, and the physical memory field of said physical memory equipment it is the storage subsystem which each of two or more physical memory equipments is equipped with a physical memory field control unit, and is characterized by this physical memory field control unit having a means to acquire the operating condition of a physical memory field.

2. A means to be connected to 1 or two or more computers, and to acquire the operating condition information on two or more physical memory equipments and two or more of these physical memory equipments. In the storage subsystem which has a means to perform matching with the logic storage region which said computer makes a read/write object, and the physical memory field of said physical memory equipment A means to acquire the operating condition information on said two or more physical memory equipments, and a means to perform matching with the logic storage region which said computer makes a read/write object, and the physical memory field of said physical memory equipment it is prepared in the control unit which controls said two or more above-mentioned physical memory equipments. Said control unit. Furthermore, it has a means to transmit the information which performed matching with the logic storage region of a physical memory equipment, and the physical memory field of physical memory equipment to said two or more physical memory equipments of each. It is the storage subsystem which each of two or more physical memory equipments is equipped with a physical memory field control unit, and is characterized by this physical memory field control unit having a means to acquire the operating condition of a physical memory field.

3. A physical memory equipment which is equipped with a physical memory field control unit, and is characterized by this physical memory field control unit having a means to perform matching with the physical memory field of the storage subsystem, and to acquire the operating condition information according to claim 1 or 2 characterized by this physical memory field control unit having a means to acquire the operating condition of a physical memory field.

4. Said physical memory field control unit is physical memory equipment according to claim 3 characterized by having further a means to store the operating condition information on the acquired physical memory field.

5. Said physical-memory field control unit is physical-memory equipment according to claim 3 or 4 characterized by to have further a means store the information which matched the logic storage region and the physical memory field of the physical-memory equipment which receives the operating condition information on the physical memory field of self-physical memory equipment from a means to transmit to said control unit, and said control unit, according to the acquisition demand of the operating-condition information on a physical-memory field which receives from said control unit.

[Translation done.]



memory equipment A means to acquire the operating condition information on said two or more physical memory equipments, and a means to perform matching with the logic storage region which said computer makes a read/write object, and the physical memory field of said physical memory equipment 12 is prepared in the control unit which controls two or more above-mentioned physical memory equipments. Said control unit Furthermore, it has a means to transmit the information which performed matching with the logic storage region of physical memory equipment, and the physical memory field of physical memory equipment to said two or more physical memory equipments 12. It has a physical memory field control unit, and this physical memory field control unit is attained by having a means of two or more of said physical memory equipments to acquire the operating condition of a physical memory field, respectively. [0015] Moreover, said purpose is set to the physical memory equipment which constitutes a storage subsystem. A means by which have a physical memory field control unit and this physical memory field control unit acquires the operating condition of a physical memory field. An acquisition demand of the operating condition information on a means to store the operating condition information on the acquired physical memory field, and the physical memory field control unit from said control unit is accepted. It is attained by having a means to transmit the operating condition information on the physical memory field of self-physical memory equipment to said control unit, and a means to store the information which matched the logic storage region and the physical memory field of the physical memory equipment received from said control unit. [0016] (Embodiment of the Invention) Hereafter, a drawing explains the operation details of the storage system for the storage subsystem by this invention, and its system to a detail.

[0017] The block diagram showing the configuration of the computer system with which drawing 1 was equipped with the storage subsystem by this invention, and drawing 2 are the block diagrams showing the configuration of physical memory equipment. In drawing 1, R2, 1 and drawing 2, A host and 12 A storage subsystem, 13 disk array control information and 15 for a disk array control device and 14 Physical memory equipment. In 16, a disk array and 17 an I/O bus and 19 for a control terminal and 18 A network, 22 a physical memory field and 130 for a physical memory field control unit and 23 The read/write processing section, 131 the relocation decision and processing section and 133 for the operating condition information acquisition processing section and 132. The relocation executive operation section, 141 class configuration information, 142 the information corresponding to logic/physics, and 142 Class attribute information, 144 Physical field operating condition information and 146 for logic field operating condition information and 143 Relocation decision information, 147 Free-space information and 148 Relocation activation information and 149 Relocation information, 149 a status information, 221 a physical memory field control unit, 222 a data processing section, 223 a data access request information section, 224 a data processing section, 225 are [A physical memory field control section and 222 / cache memory and 223 / configuration / classification Research and Data Processing Department and 227 1 the processing time amount total sections.

[0018] The computer system shown in drawing 1 consists of 1 which is the calculating machine of a high order or two or more hosts 10, a storage subsystem 12, and a control terminal 17. It connects with the storage subsystem 12 by I/O bus 18, and a host 10 publishes a lead of data, and I/O for light processing to the storage subsystem 12. In case this I/O is performed, a host 10 specifies the logical storage region of the storage subsystem 12. That is, a host 10 accesses with the address of a usually logical storage region to the data in a storage subsystem. Moreover, I/O bus 18 is constituted by ESCON, SCSI, the fiber channel, etc.

[0019] The storage subsystem 12 consists of a disk array control unit 13 and two or more physical memory equipments 15. The disk array control unit 13 is equipped with the read/write processing section 130, the operating condition information acquisition processing section 131, the relocation decision processing section 132, and the relocation executive operation section 133, and these processing sections provide the read/write processing, operating condition information acquisition, relocation decision, and relocation executive operation, etc. Moreover, the disk array control non-dense of the storage subsystem 12 holds the

information 141 corresponding to a logic storage region / physical memory field, the class configuration information 142, the disk array configuration information 140 of class attribute information 143 grade, storage occupancy hour entry 14A of the logic field operating condition information 144 and physical field operating condition information 145 grade, the relocation decision horizon information 146, the relocation activation time information 147, the free-space information 148, and relocation information 149 grade. In addition, others and parity group information, RAID level information, etc. 149 grade. Moreover, above may be included in the disk array configuration information 14 mentioned above. [Information]

[0020] Moreover, the host 10, the disk array control unit 13, and the control terminal 17 are mutually connected by the network 18. A network 19 may be constituted by Ethernet (trademark), FDDI, the fiber channel, etc. A control terminal 17 is usually used in order to perform maintenance, management, etc. of the storage subsystem 12.

[0021] Moreover, in explanation of the operation detail of the invention, although it exists, respectively, since it is not important, the component which surely exists in computers, such as memory for performing processing which appears in a host 10, the disk array control unit 13, and a control terminal 17, respectively, and CPU, is not specified here.

[0022] The class division of two or more physical memory equipments 15 formed in the above-mentioned storage subsystem 12 is carried out for every engine performance of physical memory equipments and they control the disk array 18 for every data. However, although not shown clearly, two or more physical memory equipments 15 are connected to the disk array 18 and the host 10, and each of physical memory equipment 15 is constituted by the physical memory field and control device 22 which controls the physical memory field 23 and this physical memory field 23 to be shown in drawing 2, and various data are stored in the physical memory field 23.

[0023] Moreover, if the address of the physical memory field 23 seems to have mentioned above directly from a host 10, it does not break, but a host 10 accesses the data on two or more logical storage regions on two or more physical memory fields 23. Namely, a host 10 accesses by specifying a logic storage region to the data in the storage region of each physical memory equipment 15 in the storage subsystem 12.

[0024] The disk array control unit 13 is connected with two or more physical memory equipments 15. The lead and light processing instruction I/O which controlled two or more physical memory equipments 15, or were emitted by said host 10 Make the address of the logic storage region where the appointed data exist, and the address of a physical memory field with the address of the logic storage region corresponding transmit data I/O to suitable physical memory equipment 15, and if it is light processing, the data transmitted by the host 10 are transmitted to physical memory equipment 15, and if it is lead processing, the data transmitted from physical memory equipment 15 are received, and it is processing transmitting to a host 10 etc.

[0025] The physical memory field control unit 22 which it has in physical memory equipment 15 is constituted by the physical memory field control section 221 and cache memory 222. Cache memory 222 has the quick rate of processing of the read/write of data compared with the physical memory field 23. And cache memory 222 is used as follows about the data about the lead or light instruction transmitted from the disk array control device 13. That is, in case the light data transmitted from the disk array control device 13 are written in the physical memory field 23 in light processing, data are written also in cache memory 222. Moreover, in case data reading appearance is carried out from the physical memory field 23 in lead processing, when it was written in cache memory 222, or the same data are in cache memory and it comes to physical memory equipment from the disk array control device 13 as a lead instruction to the data by former lead processing, the read data do not read the data from the physical memory field 23, but read it from cache memory 222. Thereby, the processing engine performance of physical memory equipment 15 can be improved.

[0026] The physical memory field control section 221 is mainly equipped with the operation information acquisition section 223 and the data processing section 224, and is provided with a relocation decision processing section 225. The lead or light instruction of the data transmitted from the disk array control device 13. And the data processing section

224 will read the lead data from cache memory 222. If cache memory 222 is accessed and the lead data exists in cache memory 222, it will access the physical memory field 23, read the lead data is not in cache memory 222. It will access the physical memory field 23, will read the lead data, and will transmit data to the disk array control device 13. Moreover, the data-processing control section 224 is after that, and writes the data in the physical memory field 23 at the same time it writes the data transmitted from the disk array control device 13 in cache memory 222, when the received instruction is a light processing instruction. You may not write light data in cache memory 222, but may also write them in the direct physical memory field 23.

[0027] The operation information acquisition section 223 is constituted by the access request information storage section 225, configuration / classification / research and data processing Department 226, and occupancy time amount total section 227 grade. When a logic storage region with the data specified by the I/O process, the physical memory field 23 where the data exists, or cache memory 222 is accessed, the above-mentioned data-processing control section 223 classifies the hour entry of the access for every (random access, sequential access, etc.) and the classification of an I/O process, and records on the occupancy time amount total section 227. Moreover, when the disk array control device 13 receives the data processing control section 224 receives information such as the data processing control section 223, and the logical storage region in a disk array, and the address of the physical memory field 23, and engine information of physical memory equipment 15, and records it on configuration / classification research and data processing Department 226. Furthermore, the data-processing control section 224 receives a lead of data or light instruction data transmitted from disk array control device 13 grade, and records the instruction data on the access request information storage section 225 so that it may be possible to receive two or more I/O processes.

[0028] The logic storage region according to an I/O process within physical memory equipment 15, when physical memory equipment 15 has a configuration which was mentioned above, the physical memory field 23. Or it becomes possible to classify the hour entry at the time of access when accessing cache memory 222 for every (random access, sequential access, etc.) and the classification of an I/O process, and to record on the occupancy time amount total section 227. It classifies into a physical memory field to what whether time amount access was carried out and physical memory equipment 15 of cache memory 22 it hit according to an I/O process, and it becomes possible to total the occupancy time amount.

[0029] Drawing 4 is a flow chart explaining processing actuation of a disk array control device 13. The operation information acquisition section 223 explains the operation information 141 corresponding to the disk array control unit 13 transmitted from the initialization 141 corresponding to the logic/physics which is the matching information on the address of the logic storage region in the physical memory field 23 in physical memory equipment 15, and the address of the physical memory field where the logic storage region actually exists, and the class configuration information 142 and the disk array configuration information 14 of class attribute information 143 grade to the physical memory equipment 15 connected with self-equipment 13 at the time of starting of the physical memory equipment 15 (steps 300 and 310).

[0030] (1) Next, the disk array control unit 13 receives the notice the physical memory equipment 15 sent from the physical memory field control unit 22 changed [the notice] to the accessible ready state, when physical memory equipment 15 becomes accessible by transmission of the information mentioned above. Things come and physical memory equipment 15 is in the condition of the initialization termination by the disk array configuration information 14 (step 320).

[0032] (3) Then, the disk array control device 13 receives data with more various what has transmitted host I/O of a lead or light processing to the storage subsystem 12 to the logic storage region in the storage subsystem 12, and delivers an instruction and data with the data specified by the I/O process to the disk array control unit 13 (step 330).

[0033] (4) When host I/O is sent as a light processing to the disk array control unit 13, receives the lead or light demand to the logic storage region specified by host I/O, and asks for the logic storage region address and the corresponding address of the physical memory field 23 using the information 141 corresponding to the logic/physics which changes the address (logical

address) of the logic storage region into the address (physical address) of a physical memory field (steps 340 and 350).

[0034] (5) The disk array control device 13 specifies the address of the physical-memory field where predetermined data exist, and in lead processing, transmits light data to the physical-memory equipment which transmits lead data for the physical memory equipment which has the above-mentioned physical address to lead data to read-out and a host I/O, receives the light data transmitted by the host I/O in light processing, and has the physical address (360).

[0035] Drawing 4 is a flow chart explaining processing actuation of a disk array control device when correspondence of the address of a logic storage region and the address of a physical memory field changes, and explains this hereafter.

[0036] (1) By the change in physical memory equipment 15, change of RAID level, and a logic storage region moving the disk array control device 13 to the address of a physical memory field different from a certain physical memory \*\*\* address now etc. When it supervises that correspondence of the address of a logic storage region and the address of a physical memory field changed and is changed, physical memory equipment 15 is received again. The information 141 corresponding to the logic/physics which is the matching information on the address of the logic storage region in the physical memory field is transmitted to the physical memory equipment 15, and the address of the physical memory field where the logic storage region actually exists. The configuration information 142 and the disk array configuration information 14 of class attribute information 143 grade are transmitted (step 310).

[0037] (2) Next, the disk array control unit 13 receives the notice the physical memory equipment 15 sent from the physical memory field control unit 22 changed [the notice] to the accessible ready state, when physical memory equipment 15 becomes accessible by transmission of the information mentioned above. Things come and physical memory equipment 15 is in the condition of the updating termination by the disk array configuration information 14 (step 320).

[0038] (3) Subsequent processing is performed like the case of steps 3300, 3400, 3500, and 3600 explained by drawing 3 (steps 3301, 3401, 3501, and 3601).

[\*\*] In addition, in steps 320 and 3201 mentioned above, as for the disk array control unit 13, does not need to receive the information that the physical memory field control unit 22 to physical memory equipment 15 changed in the accessible condition. In this case, what is necessary is just to perform access processing for performing predetermined processing to physical memory equipment 13, when it assumed that it is in accessible conditions, such as a physical memory field and physical memory equipment 15, and the access direction to certain storage regions for the disk array control unit 13, the disk array control unit 13. Moreover, when there is no response into waiting and fixed time amount until it performs access processing, then to perform predetermined processing again when there is no response to preprocessing in access processing, or a response comes back, it is good also as a method which tells that the module which issued the access direction to a certain storage region.

[0040] Moreover, the information 141 corresponding to logic/physics in the above-mentioned information to which a logic storage region and a physical memory field are made to correspond. And the lead address is the address which shows the logic storage region which a host I/O uses in logical read/write processing section 130. Moreover, a physical address is the address which shows the field on the physical memory equipment 15 with which data are actually stored, and consists of the physical memory device number and the address in physical memory equipment. A storage number shows each physical memory physical memory equipment 15. The address in storage is the address which shows the storage region within physical memory equipment 15.

[0041] Drawing 3 is a flow chart explaining processing actuation of the disk array control device 13 at the time of the disk array control device 13 reading the information in the operation information acquisition section 223 of physical memory equipment 15, and explains this hereafter.

[0042] (1) After the storage subsystem 12 is started, the disk array control device 13 initializes storage occupancy hour entry 14A, and transmits an acquisition demand of the access information occupancy hour entry of the physical memory equipment 15 to two or more physical memory

equipment 15 connected after that (steps 371 and 372).

[0043] (2) Next, the disk array control unit 13 stores the access occupancy hour entry of a reception and each physical memory equipment in storage occupancy hour entry 14A for an access occupancy hour entry from each physical memory equipment 15 (steps 373 and 374).

[0044] In addition, the timing of acquisition of the access occupancy information on the disk array control unit 13 mentioned above. The method which reads the access occupancy information by access to physical memory equipment 23 from the module of others by host I/O, backup, etc. to a fixed time interval from the occupancy time amount total section 227 in each physical memory equipment 15. When an access occupancy hour entry acquisition demand is transmitted to the disk array control unit 13 from other modules (for example, a host 10 and a control terminal 17), it is various and dependent on a design.

[0045] The access occupancy hour entry acquired by the above-mentioned is recorded on the occupancy time amount total table in the disk array control unit 13.

[0046] Drawing 22 is a flow chart explaining processing situation of the physical memory field information 14.

[0047] (1) The physical memory field information 14 is received from the disk array configuration information 14 which is information on the logical address and the physical address of the physical memory field 23 of the data 15 transmitted from the disk array control device 13 at the time of starting of the storage subsystem 12, i.e., physical memory equipment, such as correspondence, (steps 400 and 401).

[0048] (2) The physical creation initialization of configuration / classification information management table of configuration / classification Research and Data Processing Department 225 in the operation information acquisition section 223, or the occupancy time amount total table of the occupancy time amount total section 227 based on the information (step 402).

[0049] (3) After initialization processing of the table in step 402 is completed, in order to make the physical memory equipment 15 recognize an accessible thing, notify that initialization processing was completed to the disk array control unit 13. In addition, it is not necessary to transmit the information to which physical disk equipment changed in the accessible condition to the disk array control device 13. When the access directions to a certain storage region come to the physical memory field control unit 22 of physical memory equipment 15 after the fixed time interval, in this case, the physical memory field control unit 22 if it is in a condition accessible to the physical memory field 23, then it can perform predetermined physical access processing. The physical memory field 23, performed in the condition of having stored access information [which processing is determined in the condition of having stored access information] in the accessible information storage section 225, and having become accessible to the physical memory field is recognized, and / or you may make it not receive a certain access directions to a storage region. It comes to resemble the physical memory field 23 in the accessible condition, in order to perform predetermined processing (step 403).

[0050] (4) After that, the physical memory field control device 22 waits to transmit host I/O, and a physical memory equipment operation information acquisition demand instruction or new disk array configuration information from the disk array control device 13, and receives it (step 404).

[0051] (5) At step 404, if host I/O is received from the disk array control unit 13, when the I/O judgment lead processing or light processing and it is lead processing, the data-processing control section 224 will confirm whether the data which should be read exist in cache memory 22 (steps 405 and 406).

[0052] (6) When the data is read from cache memory 22 when the data exists in cache memory 22, and the data does not exist in cache memory 22 with the check of step 406, read the data from the physical memory field 23, and transmit data to the disk array control unit 13 (steps 407, 408 and 409).

[0053] (7) At step 405, when judged with host I/O being light processing, the data-processing control section 224 receives the light data transmitted by the host 10, and writes the light data in cache memory 22 (steps 410 and 411).

[0054] (8) And the data-processing control section 224 stores the above-mentioned light data in

the physical memory field 23 while notifying the notice of data write-in termination to the disk array control device 13 (steps 412 and 413).

[0055] The data-processing control section 224 to cache memory 22 after processing of step 408, or processing of step 413 (9) In access \*\* Or the JOB classification information on the information on whether the physical memory field 23 was accessed, a random lead, a sequential lead, etc. The access classification of the JOB classification information on the random read/write at the time of writing light data in the physical memory field 23, sequential read/write, etc. is recognized. The occupancy hour entry which accessed cache memory 22 or the physical memory field 23 is stored in the occupancy time amount total section 227 in the operation information acquisition section 223 for every access classification (steps 414 and 415).

[0056] (10) If new disk array configuration information is received from the disk array control device 13 at step 404, the data-processing control section 224 will rewrite the information in configuration / classification Research and Data Processing Department 225, the operation information acquisition section 223, corresponding to new disk array configuration information (steps 416 and 419).

[0057] (11) When a physical memory equipment operation information acquisition demand instruction is received from the disk array control device 13 at step 404, the data-processing control section 224 will access the physical memory field 23 of the physical memory equipment 15 stored in the occupancy time amount total section 227, or the physical memory equipment acquisition section 223, and transmits it to the disk array control device 13 (steps 416 and 417).

[0058] In addition, it may be made to perform transmission to the disk array control device 13 from the physical memory equipment 15 of the occupancy hour entry in processing of step 417 mentioned above to the disk array control device 13 with a fixed time interval automatically from physical memory equipment 15. In this case, said physical memory equipment operation information acquisition demand instruction is not transmitted to physical memory equipment 13 from the disk array control unit 13.

[0059] Drawing 7 is drawing explaining the example of a configuration of the information 141 corresponding to logic/physics in the table for managing correspondence with the address of a logic storage region and the address of a physical memory field which are held in the disk array control unit 13.

[0060] The disk array control unit 13 has managed correspondence with the address of the logic storage region in the physical memory field 23 in two or more physical memory equipments 15 connected, and the address of the physical memory field in the logic storage region. Each of the logic storage region other than 300 given to a specific logic storage region, the logical address 510, the physical address 520 and the number 531 with a physical storage region with the logic storage region number 520, the address 522 of the physical storage region, the RAID level 530, the number of the engine performance of the physical memory equipment 15, and the priority action 540 to which the physical-memory equipment 15 belongs is matched, and the information 141 corresponding to the logic/physics used for this is constituted, as shown in drawing 7. When processing of a lead, a light, etc. specifies the address of a logic storage region from a host 10, a control terminal 17, and other modules (for example, other disk array control units etc.), and it is accessed to the self-disk array control unit 13 by having such information 141 corresponding to logic/physics, the disk array control unit 13 can change the address of a logic field into the address of a physical storage region, and can perform read/write processing of data correctly to physical memory equipment 15.

[0061] Drawing 8 is drawing showing the example of the logic field operating condition information 144 stored in the disk array control unit 13, and the storage occupancy hour entry as an occupancy time amount total table.

[0062] The disk array control device 13 reads periodically the access occupancy information on the physical memory field 23 of the physical memory equipment 15 by access from the module of others by host I/O, backup, etc. from the occupancy time amount total section 227 in each physical memory equipment 15, and records the access occupancy hour entry on the occupancy time amount total table in the receiving disk array control device 13. The example shown in





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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the configuration of the computer system equipped with the storage subsystem by this invention.  
 [Drawing 2] It is the block diagram showing the configuration of physical memory equipment.  
 [Drawing 3] It is a flow chart explaining processing actuation of a disk array control device when storage subsystem is started.  
 [Drawing 4] It is a flow chart explaining processing actuation of a disk array control device when correspondence of the address of a logic storage region and the address of a physical memory field changes.

[Drawing 5] It is a flow chart explaining processing actuation of the disk array control device at the time of a disk array control device reading the information on operation information acquisition circles of physical memory equipment.

[Drawing 6] It is a flow chart explaining processing actuation of the physical memory field control device in physical memory equipment.

[Drawing 7] It is a flow chart explaining the example of a configuration of the information acquisition circles of the logic storage region and the physical memory field of the address of the logic storage region and physical memory field which are held in the disk array control unit.

[Drawing 8] It is drawing showing the example of storage occupancy hour entries, such as logic storage occupancy condition information stored in a disk array control unit, and physical field occupancy condition information.

[Drawing 9] It is drawing showing the example of a configuration of the table which manages matching of the address of the logic storage region and physical memory field which are stored in a configuration / classification Research and Data Processing Department in physical memory equipment.

[Drawing 10] It is drawing showing the example of a configuration of the table of the occupancy hour entry by access to the storage region accumulated and stored at the occupancy time equipment. Amount total section of the operation information acquisition section in physical memory equipment.

[Description of Notations]

- 10 Host
- 11 Storage Subsystem
- 12 Disk Array Control Unit
- 13 Disk Array Control Information
- 14 Disk Array Control Information
- 15 Physical Memory Equipment
- 16 Disk Array
- 17 Control Terminal
- 18 I/O Bus
- 19 Network
- 22 Physical Memory Field Control Unit
- 23 Physical Memory Field
- 130 Read/write Processing Section

- 131 Operating Condition Information Acquisition Processing Section
- 132 Relocation Decision Processing Section
- 133 Relocation Execution Operation Section
- 141 Information corresponding to Logic/Physics
- 142 Class Configuration Information
- 143 Class Attribute Information
- 144 Logic Field Operating Condition Information
- 145 Physical Field Operating Condition Information
- 146 Relocation Decision Horizon Information
- 147 Relocation Activation Time Information
- 148 Free-Space Information
- 149 Relocation Information
- 14A Storage occupancy hour entry
- 221 Physical Memory Field Control Section
- 222 Cache Memory
- 223 Operation Information Acquisition Section
- 224 Data-Processing Control Section
- 225 Access Request Information Storage Section
- 226 Configuration / Classification Research and Data Processing Department
- 227 Occupancy Time Amount Total Section

[Translation done.]